

IN THE CLAIMS

1. An automatic hand-holdable bar code symbol scanning device, which comprises:

a hand-holdable housing;

object detection means, disposed within said housing,
5 for automatically detecting the presence of an object within an object detection field defined external to said housing, said object detection means including means for detecting object sensing energy produced by an object sensing energy source and reflected off said object;

10 bar code presence detection means, disposed within said housing, for detecting in automatic response to the detection of said object within said object detection field, the presence of a bar code on said object within a scan field defined external to said housing, said bar code presence
15 detection means including light scanning means for scanning at least a portion of said object with a light beam produced from a light beam source, and for receiving at least a portion of said laser beam reflected off said object; and

bar code scan data generating means, disposed within
20 said housing, for producing and collecting bar code scan data from said bar code on said object within said scan field, in automatic response to the detection of said bar code by said bar code presence detection means, said bar code data generating means including said light scanning means.

2. The hand-holdable bar code symbol scanning device of claim 1, wherein said object sensing energy source comprises means for producing an infra-red light beam within said object detection field and means for receiving at least a portion of

infra-red light reflected from said object in said object detection field.

3. The hand-holdable bar code symbol scanning device of claim 1, wherein said object sensing energy source is an ambient light producing source and said object detection means comprises an ambient light sensing means for sensing variations in ambient light intensity within said object detection field, which are indicative of said object therewith.

4. The automatic hand-holdable bar code symbol scanning device of claim 1, which further comprises:

5 processing means for processing said bar code scan data signal, collected by said bar code generating means, in order to decode a bar code symbol, and upon decoding a bar code symbol, producing symbol character data corresponding to said decoded bar code symbol.

5. The hand-holdable bar code symbol scanning device of claim 4, wherein said bar code presence detection means processes said bar code scan signal data on a scan line by scan line basis in order to detect the presence of a bar code symbol within said scan field.

6. The hand-holdable bar code symbol scanning device of claim 1, wherein said object detection means comprises means for detecting object sensing energy reflected off said object.

5 7. The hand-holdable bar code symbol scanning device of claim 6, wherein said hand-holdable housing has a transmission aperture through which said scanned light beam exits said

housing and propagates toward said object and through which reflected light from said object enters said housing for collection and detection, and wherein object sensing energy reflected off said object is detected by said object detection means closely adjacent said transmission aperture.

5 8. The hand-holdable bar code symbol scanning device of claim 7, wherein said object sensing energy reflected off said object and passing through said transmission aperture is detected by said object detection means.

10 9. The hand-holdable bar code symbol scanning device of claim 1, wherein said hand-holdable housing has a transmission aperture through which said scanned light beam exits said housing and propagates toward said object, and through which reflected light from said object enters said housing for collection and detection,

15 wherein said laser scanning means has an operative scanning range measured from said transmission aperture out towards a region within said scan field,

20 wherein said scan field is characterized as having at least one scanning plane having an essentially planar extent and said object detection field is characterized as having an essentially volumetric extent, and

25 wherein said object detection field spatially encompasses at least a portion of said scan field within said operative scanning range of said laser scanning means.

10. A method of scanning a bar code symbol on an object by use of an automatic hand-holdable bar code symbol scanning device having a hand-holdable housing, means for providing an

object detection field defined external to said housing, and means for providing a scan field defined external to said housing, said method comprising the sequence of steps:

5 (a) automatically detecting the presence of an object within said object detection field by sensing object sensing energy reflected off said object;

10 (b) in automatic response to the determination of said object within said object scanning field during step (a), determining the presence of a bar code on said object within said scan field using a laser beam produced by a laser beam source disposed within said housing; and

15 (c) in automatic response to the determination of said bar code in said field during step (b), producing bar code scan data signals from said detected bar code using said laser beam, and collecting said produced bar code scan data.

11. The method of claim 10, wherein in step (a) said object sensing energy is produced from an object sensing energy source disposed within said housing, and wherein said method which further comprises:

5 (d) processing said bar code scan data collected during step (c) in order to decode a bar code symbol, and upon decoding a bar code symbol, producing symbol character data corresponding to said decoded bar code symbol.

12. The method of claim 10, wherein step (b) comprises

(1) producing said laser beam and scanning said laser beam across said scan field;

5 (2) detecting at least a portion of laser light of variable intensity reflected off said object in said scan field

and producing a first scan data signal indicative of the detecting laser light intensity; and

(3) processing said first scan data signal so as to detect the presence of a bar code symbol within said scan field.

13. The method of claim 12, wherein step (c) comprises:

(1) producing said laser beam and scanning said laser beam across said scan field, and

(2) detecting at least a portion of laser light of variable intensity reflected off said bar code symbol in said scan field and producing a second scan data signal indicative of the detected laser light intensity.

14. The method of claim 13, which further comprises after substep(c)(2),

(3) processing said second scan data signal so as to decode a bar code symbol, and upon decoding a bar code symbol, producing symbol character data corresponding to said decoded bar code symbol.

15. An automatic hand-holdable bar code symbol scanning device comprising:

a hand-holdable housing;

object detection means for producing a first control signal indicative of the presence of an object in an object detection field defined external to said housing, said object detection means including means for detecting object sensing energy reflected from said object within said object detection field;

scanning means for producing a light beam in automatic response to said first control signal, and scanning said light beam across a scan field defined external to said housing;

photoreceiving means for detecting at least a portion of light of variable intensity reflected off the object in said scan field and producing an analog signal indicative of the detected light intensity;

analog-to-digital conversion means for converting said analog data signal into a digital data signal descriptive of said detected light intensity; and

bar code presence detection means capable of processing a signal representative of said detected light intensity producing a second control signal upon detecting the presence of a bar code symbol in said scan field.

16. The automatic hand-holdable bar code symbol scanning device of claim 15, which further comprises:

symbol decoding means capable of processing digital data signals produced from said analog to digital conversion means so as to decode a bar code symbol and produce symbol character data corresponding to said decoded bar code symbol.

17. A method of reading a bar code symbol on an object by use of a hand-holdable bar code symbol reading device having a hand-holdable housing, means for providing an object detection field defined relative to said housing, and means for providing a scan field defined external to said housing, said method comprising the sequence of steps:

(a) automatically determining the presence of an object within said object detection field by sensing object

sensing energy produced by an object energy source and reflected off said object;

(b) in automatic response to the determination of said object within said object detection field during step (a),
5 detecting the presence of a bar code on said object within said scan field;

(c) in automatic response to the determination of said bar code present within said scan field during step (b), generating bar code scan data from said bar code within said
10 scan field and collecting said bar code scan data; and

(d) processing said bar code scan data collected during step (c) in order to decode a bar code symbol, and upon decoding a bar code symbol, producing symbol character data corresponding to said decoded bar code symbol.

18. The method of claim 17, wherein step (a) comprises

(1) detecting differences in ambient light intensity within said object sensing field, and

5 (2) comparing said differences in ambient light intensity with a predetermined threshold.

19. The method of claim 17, which further comprises after step (d),

(e) converting the data format of said symbol character data to a data format compatible with a host device,
5 and storing said format converted symbol character data or transmitting said data format converted symbol character data to said host device.

20. The method of claim 17, wherein step (b) comprises

(1) producing a laser beam and scanning said laser beam across said object within said scan field,

5 (2) detecting at least a portion of laser light of variable intensity reflected off said object in said scan field and producing a scan data signal indicative of the detected light intensity, and

(3) processing said scan data signal in order to detect the presence of a bar code symbol in said scan field, and thereupon generating a bar code presence indication signal.

21. The method of Claim 20, wherein substep (b)(3) comprises processing said scan data signal on a scan line by scan line basis in order to detect essentially the envelope of said bar code symbol within said scan field.

22. The method of Claim 20, wherein step (c) comprises

(1) producing a laser beam from a laser beam producing means disposed in said housing, and scanning said laser beam across said bar code within said scan field, and

5 (2) detecting at least a portion of laser light of variable intensity reflected off said bar code in said scan field and producing a scan data signal indicative of the detected light intensity, and wherein step (d) comprises

10 (1) processing said scan data signal in order to decode a bar code symbol and upon decoding a bar code symbol, thereupon producing said symbol character data corresponding to said decoded bar code symbol.

23. A scanning system for scanning a coded symbol located on an object, said scanning system comprising:

a hand-holdable housing;

means for providing an object detection field defined external to said housing;

means for providing a scan field defined external to said housing;

5 first means for automatically detecting object sensing energy reflected off of an object located within said object detection field, and for producing a first signal indicative thereof; and

10 scanning means within said housing for producing a light beam and scanning said light beam across said scan field in automatic response to said first signal.

24. The system of claim 23, which further comprises second means disposed within said housing, for detecting at least a portion of light of variable intensity reflected off said object in said scan field and producing a 5 second signal indicative of the detected light intensity;

third means responsive to said second signal for producing a third signal representative of the presence of a coded symbol within said scan field; and

10 symbol decoding means, responsive to said third signal, for decoding said coded symbol and providing an output signal descriptive of said decoded symbol.

25. The system of claim 23, wherein said object sensing energy is infra-red light produced from an infrared light transmitting means disposed in said housing.

26. The system of claim 23, wherein said hand-holdable housing has a transmission aperture through which said scanned light beam exits said housing and propagates toward said object,

and through which reflected light from said object enters said housing for collection and detection.

27. The system of claim 26, wherein object sensing energy reflected off said object is detected by means disposed closely adjacent said transmission aperture.

28. The system of claim 26, wherein said object sensing energy reflected off said object passes through said transmission aperture and is detected within said housing.

29. The system of claim 23, wherein said hand-holdable housing has a transmission aperture through which said light beam exits said housing and propagates toward said object, and through which reflected light from said object enters said housing for collection and detection,

wherein said scanning means has an operative scanning range, measured from said transmission aperture out towards a region within said scan field,

wherein said scan field is characterized as having at least one scanning plane of essentially planner extent and said object detection field is characterized as having an essentially volumetric extent; and

wherein said object detection field spatially encompasses at least a portion of said scan field within said operative scanning range of said scanning means.

30. A method of scanning a coded symbol located on an object by use of apparatus including a hand-holdable housing containing means for detecting object sensing energy within an object detection field defined external to said housing, and a

means for producing and scanning a light beam across a scan field defined external to said housing, said method comprising the steps of:

(a) supporting said housing near an object so that
5 said object is within at least a portion of said object detection field;

(b) detecting object sensing energy reflected off of
said object when said object is located within said object
detection field, and producing a first signal indicative
10 thereof; and

(c) producing and scanning a light beam across said
scan field in automatic response to said first signal.

31. The method of claim 30 which further comprises:

detecting at least a portion of light of variable
intensity reflected off said object in said scan field and
producing a second signal representative of the detected light
5 intensity;

processing said second signal and producing a third
signal indicative of the presence of a coded symbol within said
scan field; and

decoding said coded symbol in response to said third
10 signal and providing an output signal descriptive of said
decoded symbol.

32. The method of claim 31, wherein said object sensing
energy comprises infrared light transmitted from said housing.

33. The method of claim 32, wherein said light beam
comprises a laser beam.

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34. A method for scanning a coded symbol located on an object using apparatus including a hand-holdable housing containing means for detecting object sensing energy within an object detection field defined external to said housing, and means of producing and scanning a light beam across a scan field defined external to said housing, said method comprising the steps of:
- (a) producing a first signal in automatic response to the presence of an object within said object detection field;
- 10 (b) producing a light beam and scanning said light beam across said scan field, in automatic response to said first signal;
- (c) detecting at least a portion of light of variable intensity reflected off said object in said scan field and producing a second signal indicative of the detected light intensity;
- 15 (d) producing a third signal representative of the presence of a coded symbol within said scan field, in response to said second signal; and
- (e) decoding said coded symbol and providing an output signal representative of said decoded symbol, in response to said third signal.

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35. A scanning system for scanning a coded symbol located on an object, said system comprising:
- housing having a transmission aperture permitting passage of light out of and into said housing;
- 5 object detection means within said housing for detecting object sensing energy within an object detection field defined external to said housing, and for automatically

producing a first signal indicative of the presence of an object within said object detection field;

scanning means disposed within said housing for producing in automatic response to said first signal, a light beam and scanning said light beam through said transmission aperture and across a scan field defined external to said housing;

light detection means disposed within said housing for detecting at least a portion of light of variable intensity reflected off said object in said scan field and passing through said transmission aperture, and for producing scan data representative of the detected light intensity;

first processing means for processing scan data and producing a second signal indicative of the presence of a coded symbol on said object within said scan field; and

second processing means responsive to said second signal, for processing scan data from said light detection means so as to produce symbol character data representative of a decoded symbol and providing an output signal indicative of said decoded symbol.

36. The scanning system of claim 35, wherein said scanning system has an operative scanning range measured from said transmission aperture out towards a region within said scan field,

wherein said scan field is characterized as having at least one scanning plane of essentially planar extent and said object detection field is characterized as having an essentially volumetric extent, and

wherein said object detection field spatially encompasses at least a portion of said scan field within said operative scanning range of said scanning means.

37. The scanning system of claim 36, wherein said object detection means has at least a short-range and a long-range mode of object detection,

wherein, when said object detection means is in said short range mode of object detection, said object detection means is capable of detecting the presence of an object located within a short range measured from said transmission aperture out towards a first region within said object detection field, and

wherein, when said object detection means is in said long-range mode of object detection, said object detection means is capable of detecting the presence of an object located within a long range measured from said transmission aperture out towards a second region within said object detection field.

38. The system of claim 37, wherein said housing is hand-holdable, and wherein said system further comprises means on said housing for manually producing a short range mode activation signal.

39. The system of claim 37, wherein said housing is hand-holdable, and wherein said system further comprises hand-holdable housing support stand detection means for detecting placement of said hand holdable housing within a support stand and producing a long range mode activation signal in response thereto.